PATENT CLAIMS

1. A method of making a strained layer on a substrate (1, 2) with the steps:

generating a defect region (99) in a layer (1, 2, 4, 6) neighboring the layer (3, 5) to be subjected to strain,

relaxing at least one layer (4, 6) neighboring to the layer (3, 5) to be strained to form the strained layer.

2. The method according to the preceding claim in which dislocations extend from a defect region which give rise to a relaxation of one of the layers (4, 6) neighboring the layer (3, 5) to be strained.

3. The method according to one of the preceding claims characterized in that the layer structure is subjected to at least one thermal treatment and/or oxidation for relaxation.

4. The method according to one of the preceding claims characterized in that the defect region (99) is produced in the substrate (1).

5. The method according to one of the preceding claims characterized in that at least one first layer (6) is epitactically deposited on the layer (5) to be strained.

6. The method according to one of the preceding claims characterized in that the first layer (6) has a different degree of dislocation than the layer (5) to form the strained layer.

7. The method according to one of the preceding claims characterized in that the first layer (6) is relaxed.

8. The method according to one of the preceding claims characterized in that between the layer (5) to be strained and the substrate (1, 2) a further layer (4) is disposed.

9. The method according to one of the preceding claims characterized in that the further layer (4) has a different degree of dislocation than the layer (5) to be strained.

10. The method according to one of the preceding claims characterized in that a plurality of layers (4, 6) are relaxed.

11. The method according to one of the preceding claims characterized in that a plurality of layers (3, 5) to be strained, are strained.

12. The method according to one of the preceding claims in which an epitactic layer structure comprised of a plurality of layers on different substrates (1, 2, 3, 4, 5, 6) is made in a deposition process.

13. The method according to one of the preceding claims characterized in that applied layers are thereafter removed.

14. The method according to one of the preceding claims characterized in that at least one strained layer (5) is produced on a thin relaxed layer (4).

15. The method according to one of the preceding claims characterized in that a removal of a layer by means of implantation, especially by means of hydrogen or helium implantation is carried out.

16. The method according to one of the preceding claims characterized in that the defect region produced is used as a separating plane.

17. The method according to one of the preceding claims characterized in that the defect region (99) is produced by at least one ion implantation.

18. The method according to one of the preceding claims characterized in that for an implantation, hydrogen ions and/or helium ions are selected.

19. The method according to one of the preceding claims characterized in that ions with a dose of 3×10^{15} through 4×10^{16} cm^{-2} are selected for producing the defect region (99).

20. The method according to one of the preceding claims characterized in that Si ions are selected for the implantation.

21. The method according to one of the preceding claims characterized in that a dose of 1×10^{13} to 5×10^{14} cm^{-2} is used to produce the defect region (99).

22. The method according to one of the preceding claims characterized in that for the implantation, hydrogen ions, carbon ions, nitrogen ions, fluorine ions, boron ions, phosphorous ions, arsenic ions, silicon ions, germanium ions, antimony ions, sulfur ions, neon ions, argon ions, krypton ions or xenon ions or an ion type of the layer material itself is used for producing the defect region (99).

23. The method according to one of the preceding claims characterized in that a relaxation over a limited region of at least one layer (4, 6) is effective.

24. The method according to one of the preceding claims characterized in that a mask (66) is arranged on the layer structure.

25. The method according to one of the preceding claims characterized in that the layer structure is relaxed only on the implanted region and/or is stressed.

26. The method according to one of the preceding claims characterized in that the layer structure is primarily irradiated with ions.

27. The method according to one of the preceding claims in which hydrogen and/or helium is implanted to a considerable depth and during a subsequent heat treatment, collects in a defect region and thus enables separation.

28. The method according to one of the preceding claims characterized in that the dose for the hydrogen and/or helium implantation can be reduced for the separation.

29. The method according to one of the preceding claims characterized in that in the layer structure primarily crystal defect and/or in the substrate proximal to the epitactic layer structure an extended defect region (99) is produced.

30. The method according to one of the preceding claims characterized in that the energy of the implanted ion is so selected that the mean range is greater than the total layer thickness of the epitactic layer structure.

31. The method according to one of the preceding claims characterized in that the thermal treatment is carried out in a

temperature range of 550 degrees C to 1200 degrees C, especially from 700 degrees C to 950 degrees C.

32. The method according to one of the preceding claims characterized in that the thermal treatment is carried out in an inert, reducing, nitriding or oxidizing atmosphere.

33. The method according to one of the preceding claims characterized in that the dislocation density after the growth amounts to less than 10^5 cm^{-2}.

34. The method according to one of the preceding claims characterized in that a strained layer (5') and/or an unstrained layer (5) with a surface roughness of less than 1 nanometer are produced.

35. The method according to one of the preceding claims characterized in that a layer structure comprising silicon, silicon-germanium (Si-Ge) or silicon-germanium-carbon (Si-Ge-C) or silicon carbide (Si-C) is deposited upon a substrate (1).

36. The method according to one of the preceding claims characterized in that a layer structure comprised of a III-V compound semiconductor, especially a III-V nitride, a II-VI compound semiconductor or an oxidic perovskite is deposited on the substrate (1).

37. The method according to one of the preceding claims characterized in that Si-Ge is used as the material for at least one of the layers (4, 6) to be relaxed.

38. The method according to one of the preceding claims characterized in that two Si-Ge layers (4, 6) are relaxed.

39. The method according to one of the preceding claims characterized in that at least one layer with an additional carbon content of one to two atomic percent is provided and in which relaxation is carried out.

40. The method according to one of the preceding claims characterized in that an SOI substrate (1, 2, 3) (silicon on insulator) is selected.

41. The method according to one of the preceding claims characterized in that an Si layer (3, 5) with a layer thickness below 200 nanometers is selected.

42. The method according to one of the preceding claims characterized in that silicon, silicon germanium (Si-Ge), silicon carbide (Si-C), sapphire or an oxidic perovskite or a III-V or II-VI compound semiconductor is selected as the substrate (1).

43. The method according to one of the preceding claims characterized in that a wafer bonding is carried out.

44. The method according to one of the preceding claims characterized in that the layer structure is bonded to a second substrate.

45. The method according to one of the preceding claims characterized in that the layer structure is bonded to a substrate with an MIO2 layer.

46. The method according to one of the preceding claims characterized in that at least the first substrate is removed.

47. The method according to one of the preceding claims characterized in that on a strained silicon region (5') an n- and/or p- MOSFET is produced.

48. The method according to one of the preceding claims characterized in that on at least a strained silicon germanium (Si-Ge) region as a nonrelaxed region of a layer, a p- MOSFET is produced.

49. The method of producing a layer structure comprising a plurality of strained layers characterized in that one or more of the method steps in claims 1 - 48 are utilized a plurality of times.

50. A layer structure comprising a layer (4', 4; 5', 5) on a substrate (1) characterized in that the layer (4', 4; 5', 5) is configured to be in part strained.

51. The layer structure comprising a substrate characterized in that on the substrate (1, 2) a strained region (5') of a layer is located in a plane planar adjacent an unstrained region (5) of this layer.

52. A layer structure according to the preceding claim characterized in that at least a strained region (5') of a layer is disposed on at least one relaxed region (4') of another layer.

53. A layer structure according to the preceding claim characterized in that a strained region (5') of one layer is disposed between two relaxed regions of two further layers.

54. A layer structure according to the preceding claim characterized in that at least a relaxed region (4') is provided in a plane in planar relationship adjacent at least one strained region (4).

55. A component comprising a layer structure in accordance with one of the preceding claims 50 through 54.

56. A fully depleted p-MOSFET as the component according to claim 55.

57. A modulated doped field defect transistor (MODFET) or metal oxide semiconductor field effect transistor (MOSFET) as the component according to claim 55.

58. A tunnel diode especially a silicon germanium (Si-Ge) tunnel diode as the component according to claim 55.

59. A photodetector as the component according to claim 55.

60. A laser, especially a quantum cascade laser on the basis of Si-Ge, as the component according to claim 55.